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Results of Tests of Commercial Legume Inoculants in 1944

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COMMERCIAL LEGUME INOCULANTS are being tested by the United States Department of Agriculture in accordance with authority originally granted in 1916 and continued annually in the appropriation acts¹ since that time, providing for soil microbiology investigations—

. . . including the testing of samples, procured in the open market, of cultures for inoculating legumes, [other crops, or soil,] and if any such samples are found to be impure, nonviable, or misbranded, the results of the tests may be published, together with the names of the manufacturers and of the persons by whom the cultures were offered for sale, . . .

COMMERCIAL INOCULANTS TESTED

The present report covers the period July 1, 1943, to June 30, 1944, during which a total of 668 samples bearing 38 different trade names were collected in 33 of the States. These samples are the products of 10 manufacturers, a list of whom, together with the trade names used, is given in table 1.

¹ UNITED STATES CONGRESS. AN ACT MAKING APPROPRIATIONS FOR THE DEPARTMENT OF AGRICULTURE FOR THE FISCAL YEAR ENDING JUNE 30TH, 1917, AND FOR OTHER PURPOSES. 64th Cong., 1st sess., Public 190 [H. R. 12717], p. 8. 1916. (Material in brackets is found in the appropriation act of 1944.)

TABLE 1.—*List of trade names and manufacturers of inoculants for legumes*

Trade name ¹	Carrier	Manufacturer	Address
Cal-Rhiz ²	Paste (?)	Nelson Laboratories.....	Stockton, Calif.
Farmogerm.....	Agar	Earp-Thomas Laboratories, Inc.	Bloomfield, N. J.
Humogerm.....	Peat		
Hansen's Humus Inoculator.....	do.....	Hansen Inoculator Co.....	Urbana, Ill.
Co-op Humus Inoculator.....	do.....		
Eastern States Legume Inoculant.....	do.....		
Hansen's Inoculator.....	Agar		
Kelly's Humus Inoculator.....	Peat		
Legume-Aid.....	do.....	Agricultural Laboratories, Inc.	Columbus, Ohio.
G. L. F. Legume Inoculant.....	do.....		
Sacco Legume Inoculant.....	do.....		
Unico Legume Inoculant.....	do.....		
Legumogen.....	do.....	The Legumogen Labora- tories, Inc.	Delphi, Ind.
Nitragin.....	do.....	The Nitragin Co., Inc.....	Milwaukee, Wis.
Nod-O-Gen Pretested Inoculator.....	do.....		
Cofer's Hitest Inoculator.....	do.....	The Albert Dickinson Co....	Chicago, Ill.
Gold Medal Inoculator.....	do.....		
Hoffman's Inoculator.....	do.....		
May-Bell Inoculator.....	do.....		
M Inoculator.....	do.....		
Ohio Farmers Seed Inoculation.....	do.....		
Simplex 2 in 1 Inoculator.....	do.....		
Trinity Brand Inoculator.....	do.....	Strasburger & Siegel.....	Baltimore, Md.
Wood's Seed Inoculation.....	do.....		
Superyield Culture.....	Agar	Kalo Inoculant Co.....	Quincy, Ill.
Uni-Culture No. 2.....	Peat		
American Tubercle Germ.....	do.....	Kalo Inoculant Co.....	Quincy, Ill.
Berry's Superior Nodule Germ.....	do.....		
Blue Ribbon Inoculation.....	do.....		
Blue Seal Grow Crop Inoculant.....	do.....		
Corneli Keystone Inoculation.....	do.....		
Farm Master Nitrogen-Fixing In- oculant.....	do.....	The Urbana Laboratories...	Urbana, Ill.
Kalo Inoculation.....	do.....		
Perfection Brand Legume Inoculant.....	do.....		
Southern States Quality Inocula- tion.....	do.....		
Uni-Culture No. 3.....	do.....	The Urbana Laboratories...	Urbana, Ill.
Urbana Culture.....	Agar		
Urbana Humus Inoculator.....	Peat		

¹ Indented trade names indicate material that originated in the same laboratory as that of the unindented name above, but some inoculants are distributed by firms other than the manufacturer.

² Samples were out of date when used.

METHOD OF TESTING

Inspection at present is a greenhouse operation, the methods and materials of which are fully described in United States Department of Agriculture Circular 703.² Briefly, the testing of inoculants consists of (1) applying inoculants to small quantities of disinfected seed of the kinds for which they are intended, approximately at the rate given in the directions on the package; (2) planting these seeds in disinfected sand; (3) growing them in the presence of necessary nutrients, with

² LEONARD, L. T. METHOD OF TESTING LEGUME BACTERIA CULTURES AND RESULTS OF TESTS OF COMMERCIAL INOCULANTS IN 1943. U. S. Dept. Agr. Cir. 703, 8 pp. 1944.

the exception of nitrogen, under especially sanitary greenhouse conditions; and (4) observing the effect of the inoculating material by comparing plants from treated and from untreated seed. The main effects of satisfactory response of inoculants are evidenced first by the production of nodules, which indicates the presence of the correct species of nodule bacteria in the sample; and second by the production of good normal green growth, which indicates the ability of the organisms in the sample to supply nitrogen to the plant (fig. 1).



FIGURE 1.—Cowpeas in foreground show nitrogen deficiency—leaves light yellow, growth retarded because of lack of nodule bacteria in the soil. In the background are plants associated with their proper legume bacteria—plants larger, more vigorous, and with dark-green foliage.

TABLE 2.—Summary of results of greenhouse tests on samples of legume bacteria cultures of commercial origin in the fiscal year 1944

[S=satisfactory, U=unsatisfactory]

Trade name	Alfalfa		Clover		Cowpeas		Lespedeza		Soybeans		Beans		Vetch		Miscellaneous		Total		Source total	
	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S	U	S
Farmogerm	2	0	1	1					0	2			0		2	0	5	7	13	14
Humogerm	1	1	2	2					3	0			0		2	0	8	7		
Hansen's Humus Inoculant	0	3	0	3			0		1	10			0		2	0	1	20		
Eastern States Legume Inoculant	0	2	0	2			0		0	2			0				0	10		
Co-op Humus Inoculant									0	1							0	1		41
Hansen's Inoculant									0	1							0	2		
Kelly's Inoculant	0	2	0	2			0		0	1			1				0	8		
Legume-Aid	0	10	2	8			0		0	2							0	3		
G. L. F. Legume Inoculant	0	6	0	4			0		0	19			1		0	10	0	88		
Sacco Legume Inoculant	0	6	0	6					0	4			0		0	2	0	15		126
Unico Legume Inoculant	0	2	0	2					0	1							0	5		
Legumogen	0	2							0	2							0	4		4
Nitragin	0	24	0	14			0		1	21			0		0	27	13	117		117
Nod-O-Gen Protected Inoculant	0	6	0	8			0		0	16			0		0	17	0	66		
Coker's Hicest Inoculant	0	3	0	3			0		0	2			0		0	3	0	17		
Gold Medal Inoculant	0	2	0	2			0		1	0			0		0	3	0	13		
Hoffman's Inoculant	0	3	0	3			0		0	2			0		0	3	0	16		
May-Bell Inoculant	0	3	0	3			0		0	2			0		0	3	0	15		185
M Inoculant	0	3	0	3			0		0	2			0		0	2	0	12		
Ohio Farmers Seed Inoculant	0	1	0	1					0	1							0	3		
Simplex 2 in 1 Inoculant	0	2	0	2													0	4		
Trinity Brand Inoculant	0	2	0	3			0										0	7		
Wood's Seed Inoculation	0	3	0	5			0		0	3			0		0	8	0	32		16
Superyield Culture																	0	4		
Uni-Culture No. 2	0	5	0	5													0	16		
American Tubercle Germ																	0	10		
Berry's Superior Nodule Germ	0	3	0	3			0		0	2			0		0	6	3	13		
Blue Ribbon Inoculant	0	3	0	3			0		0	3			0		0	9	0	9		
Blue Seal Grow Crop Inoculant	0	6	0	6					0	3			0		0	16	0	16		
Cornell Keystone Inoculant	0	3	0	3					0	4			0		0	6	0	13		140
Farm Master Nitrogen-Fixing Inoculant	0	3	0	3			0		0	2			0		0	6	0	6		
Kalo Inoculation									0	4							5	10		
Perfection Brand Legume Inoculant	0	10	0	10			0		0	8			5		0	8	0	30		
Southern States Quality Inoculant	0	3	0	3			0		0	4					0	10	0	18		
Uni-Culture No. 3	0	3	0	3			0		0	3					0	9	0	9		
Urban Culture	0	4	0	4			0		0	1			0		0	3	0	13		34
Urban Humus Inoculant	0	4	0	4			0		0	6			0		0	4	0	21		
Total	3	133	8	122	0	47	0	61	5	138	12	12	9	98	4	66	41	677	41	677

INOCULATION OF SEEDS AND RESULTS

Commercial legume inoculants are commonly prepared for the purpose of treating seeds of a group of legumes related from the standpoint of their nodule bacteria. Also preparations are made that combine the nodule bacteria of two or more groups of legumes in one package. Such samples are tested in accordance with the groups they contain, and each group is reported as a separate sample in table 2. This makes it appear that more samples were tested than collected. Groups are designated in the table usually by the name of the principal legume, and such grouping is shown below with other members of the groups.

Group designation:	<i>Legumes utilized in testing samples</i>
Alfalfa.....	Alfalfa, bur-clover, and sweetclover.
Clover.....	Alsike, crimson, red, and white clover.
Cowpea.....	Cowpea, crotalaria, kudzu, lima bean, mung bean, peanut, and velvetbean.
Soybean.....	Biloxi, Laredo, Tokyo, and Virginia field soybean; and Giant Green, Sousei, and P. I. No. 81044 edible soybean.
Bean.....	Top Notch Golden Wax, Plentiful, and Michelite bean.
Vetch.....	Alaska, Austrian Winter, and sweet peas and hairy vetch.
Miscellaneous.....	Garden bean, garden pea, lima bean, edible soybean in garden combinations and alyce clover, birdsfoot trefoil, blue and yellow lupine, and sesbania.

Ordinarily the maximum useful period indicated on samples of commercial inoculating material does not exceed 1 year, and because of definite seasonal demands most packages of inoculants are kept only a short time by the merchandisers. Occasionally samples are found upon which no dates of expiration are shown. These may be kept a long time by the seller, and the purchaser has no means of determining whether or not they are fresh.

In the retail distribution of products of this type through mills, seed, hardware, and other stores it is to be expected that an occasional package will be found defective. This may be caused by exposure to excessive heat or by drying in long-continued storage, possibly occasioned by a lack of expiration date. When a large number of samples from the same producer are found unsatisfactory, however, the fault may lie in the methods of his laboratory.

A case of this sort seems indicated with the materials bearing the trade names Farmogerm and Humogerm, originating in the Earp-Thomas Laboratories, Inc. Last year, as reported in Circular 703, these inoculants were 61 percent unsatisfactory, while in the present year, as shown in table 2, they are 48 percent unsatisfactory. These figures do not compare favorably with the general average, which in

the previous year was 9.4 percent and in the present year is 5.7 percent defective samples.

Major deficiencies in samples of inoculants as indicated in table 2 have been promptly brought, by correspondence, to the attention of the producers concerned, and the responses show a favorable interest in correcting the conditions found.

